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A Comprehensive Review on Artificial Intelligence, Machine Learning and Deep Learning

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ABSTRACT

AI is a branch of computer science dealing with the simulation of intelligent behaviour in computers. It is the capability of a machine to imitate intelligent human behaviour. Artificial Intelligence (AI) is a rapidly advancing technology, made possible by the Internet that may soon have significant impacts on our everyday lives. AI traditionally refers to an artificial creation of human-like intelligence that can learn reason, plan, perceive, or process natural language. AI has the potential to vastly change the way that humans interact, not only with the digital world, but also with each other, through their work and through other socioeconomic institutions – for better or for worse. In this paper we will have an overview on what is an Artificial intelligence, machine learning and deep learning.

Keywords: artificial intelligence, natural language, machine learning, deep learning

Abbreviations: AI- Artificial Intelligence, ML – Machine Learning, DRPA-Defence Advanced Research Project Agency, SXSW - South by Southwest Festival, RL - Reinforcement learning

I.INTRODUCTION

Artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, unlike the natural intelligence displayed by humans and animals. Leading AI textbooks define the field as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals.[1] Colloquially, the term "artificial intelligence" is often used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving".

II.EVOLUTION

John McCarthy first coined the term artificial intelligence in 1956 when he invited a group of researchers from a variety of disciplines including language simulation, neuron nets, complexity theory and more to a summer workshop called the Dartmouth Summer Research Project on Artificial Intelligence to discuss what would ultimately become the field of AI.In 1959 research started in MIT. In 1961 first chatbot ELIZA was introduced. On February 24, 1956, Arthur Samuel's Checkers program, which was developed for play on the IBM 701, was demonstrated to the public on television. In 1962, self-proclaimed checkers master Robert Nearly played the game on an IBM 7094 computer. It is still considered a milestone for artificial

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intelligence. In October 2005 the second DRPA (Defence Advanced Research Project Agency) grand challenge held in a desert environment. GPS points were placed and obstacle types were located in advance. This year, five vehicles completed the course. Sophia is a social humanoid robot developed by Hong Kong-based Company Hanson Robotics. Sophia was first turned on February 14, 2016, and made her first public appearance at South by Southwest Festival (SXSW) in mid-March 2016 in Austin, Texas, United States.

III.TECHNOLOGY EVOLUTION

A) ARTIFICIAL INTELLIGENCE: AI enables machines to think without any human intervention. There are three different stages of AI

1) Narrow intelligence: which is goal-oriented and programmed to perform a single task? Which is also considered as a week intelligence which can accomplish only specific task e.g.: Alexa.
2) AGI (Artificial General Intelligence): which allows machines to learn, understand, and act in a way that is indistinguishable from humans in a given situation. This should be like a robot which can go and wander by itself.
3) ASI (Artificial Super Intelligence): is a hypothetical AI where machines are capable of exhibiting intelligence that surpasses brightest humans. This should be like a robot which we can see in fiction movies.

B) MACHINE LEARNING (ML): ML is a subset of AI that uses statistical learning algorithms to build smart systems. The recommendation systems on music and video streaming services are examples of ML. The machine learning algorithms are classified into three categories: supervised, unsupervised and reinforcement learning.

1) Supervised Learning: It is the machine learning task of learning a function that maps an input to an output based on example input-output pairs. It is basically a technique which we teach or train the machine by using the data given. In this the module is fed with a label.
2) Unsupervised Learning: Unsupervised learning is a type of machine learning algorithm used to draw inferences from datasets consisting of input data without labelled responses. The most common unsupervised learning method is cluster analysis, which is used for exploratory data analysis to find hidden patterns or grouping in data.
3) Reinforcement Learning: Reinforcement learning (RL) is an area of machine learning concerned with how software agents ought to take actions in an environment in order to maximize the notion of cumulative reward.

C) DEEP LEARNING (DL): Deep learning is an artificial intelligence (AI) function that imitates the workings of the human brain in processing data and creating patterns for use in decision making. Deep learning is a subset of machine learning in artificial intelligence that has neural networks capable of learning unsupervised from data that is unstructured or unlabelled. Also known as deep neural learning or deep neural network. Deep learning unravels huge amounts of unstructured data that would normally take humans decades to understand and process. Deep learning machines don't require a human programmer to tell them what to do with the data. This is made possible by the extraordinary amount of data we collect and consume data is the fuel for deep-learning models.

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IV. ARTIFICIAL INTELLIGENCE VS MACHINE LEARNING VS DEEP LEARNING

In 2020, people benefit from artificial intelligence every day: music recommender systems, Google maps, Uber, and many more applications are powered with AI. However, the confusion between the terms artificial intelligence, machine learning, and deep learning remains. artificial intelligence (AI), machine learning (ML), and deep learning (DL) are three different things.

1) Artificial intelligence is a science like mathematics or biology. It studies ways to build intelligent programs and machines that can creatively solve problems, which has always been considered a human prerogative.
2) Machine learning is a subset of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. In ML, there are different algorithms (e.g. neural networks) that help to solve problems.
3) Deep learning, or deep neural learning, is a subset of machine learning, which uses the neural networks to analyse different factors with a structure that is similar to the human neural system.

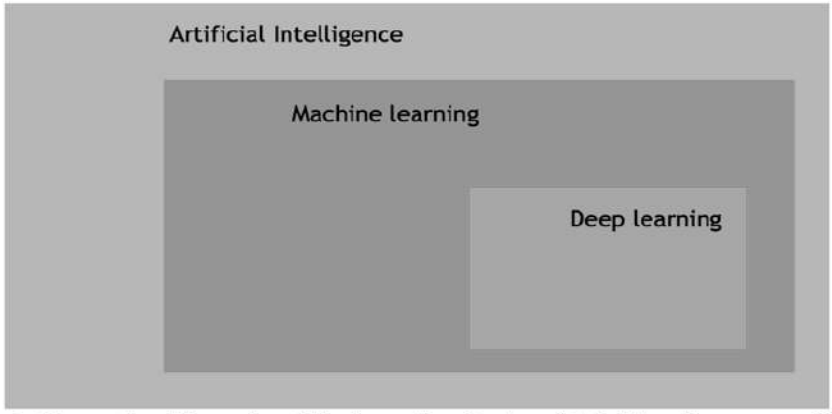

Figure 1: Shows the Hierarchy of the Learning System (Ref: https://www.guru99.com)

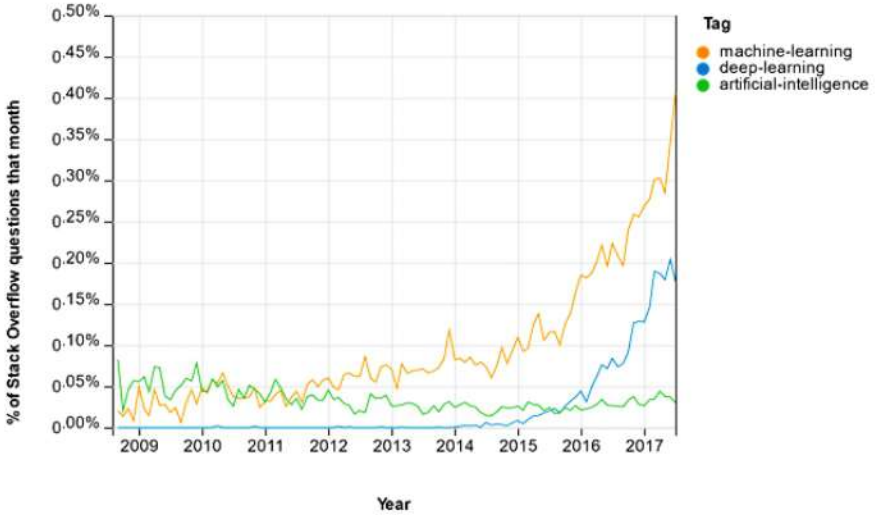

Figure 2: Shows the Growth of the Technology year wise (Ref: https://www.guru99.com)

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V.APPLICATIONS OF AI

A) ARTIFICIAL INTELLIGENCE IN HEALTHCARE:
AI is a study realized to emulate human intelligence into computer technology that could assist both, the doctor and the patients in the following ways:

i) By providing a laboratory for the examination, representation and cataloguing medical information
ii) By devising novel tool to support decision making and research
iii) By integrating activities in medical, software and cognitive sciences
iv) By offering a content rich discipline for the future scientific medical communities.

B) ARTIFICIAL INTELLIGENCE IN BUSINESS:
Robotic process automation is being applied to highly repetitive tasks normally performed by humans. Machine learning algorithms are being integrated into analytics and CRM (Customer relationship management) platforms to uncover information on how to better serve customers. Chatbot have already been incorporated into websites and e companies to provide immediate service to customers. Automation of job positions has also become a talking point among academics and IT consultancies.

C) AI IN EDUCATION:
It automates grading, giving educators more time. It can also assess students and adapt to their needs, helping them work at their own pace.

D) AI IN AUTONOMOUS VEHICLES:
AI has several applications for these vehicles and among them the more immediate ones are as follows:

i) Directing the car to gas station or recharge station when it is running low on fuel.
ii) Adjust the trips directions based on known traffic conditions to find the quickest route.
iii) Incorporate speech recognition for advanced communication with passengers.
iv) Natural language interfaces and virtual assistance technologies.

E) AI FOR ROBOTICS: Will allow us to address the challenges in taking care of an aging population and allow much longer independence. It will drastically reduce, may be even bring down traffic accidents and deaths, as well as enable disaster response for dangerous situations for example the nuclear meltdown at the Fukushima power plant.

VI.CONCLUSION

In the future, predictive analytics and artificial intelligence could play an even more fundamental role in content creation and also in the software fields. Open source information and artificial intelligence collection will provide opportunities for global technological parity and the technology of artificial can become the future in all the domains of health, environment, public safety and security.

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